

## VERNAL FLIGHT OF MALES IN SOME WESTERN BUMBLEBEES (HYMENOPTERA, BOMBIDAE).

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Frison,<sup>1</sup> in the course of his studies of the biologies of the bumblebees of Illinois, has pointed out that the males of *Bombus bimaculatus* Cresson appear early, usually in July but sometimes as early as the middle of June. Apparently the same is true for certain western bumblebees. Linsley and Michener<sup>2</sup> have reported the capture on June 12, 1941, of males of *Bombus edwardsii* Cresson at Manzanita Lake, Shasta County, California, and on May 19, 1941, at Viola, Shasta County. Since the first locality is at an elevation of nearly 6000 ft., the latter at about 5000 ft., both dates fall in the Spring season. In 1942, I had an opportunity to verify spring flights of several species of male bumblebees in the Sierra Nevada Mountains of Madera and Mariposa Counties, California. Males of *B. edwardsii* were abundant at Oakhurst when this locality was first visited on June 4, where they were about flowers of lupine. At Miami Ranger Station and Fish Camp, elevation approximately 5000 ft., queens of *Bombus edwardsii* and *B. vosnesenskii* were abundant when we arrived on May 10, but gradually tapered off and were scarce after June 1. Workers of these two species were not yet common on June 1. However, after June 1, males began to appear in numbers. On June 10, a random sample of bumblebees taken from flowers in the meadows near Fish Camp (*Eriogonum* predominant) yielded the following specimens:<sup>3</sup>

Species	Males	Queens	Workers
<i>Bombus edwardsii</i> Cresson . . . .	217	1	0
<i>Bombus vosnesenskii</i> (Rads.) . .	5	1	0
<i>Bombus sitkensis</i> Nylander . . . .	2	0	0

<sup>1</sup> Frison, T. H. A contribution to the knowledge of the life history of *Bremus bimaculatus* (Cresson). *Entom. Amer.*, 8: 159-214. 1928.

<sup>2</sup> Linsley, E. G., and C. D. Michener. Notes on some Hymenoptera from the vicinity of Mt. Lassen, California. *Pan-Pac. Ent.*, 18: 27-29. 1942.

<sup>3</sup> Identifications by Mr. P. H. Timberlake, Citrus Experiment Station, Riverside, California.

<i>Psithyrus crawfordi</i> Franklin . .	49	0	—
<i>Psithyrus fernaldae</i> Franklin . .	2	0	—
Total . . . . .	275	2	0

Two days later, on June 12, male bumblebees were observed in great abundance at Wawona, Mariposa County; a few queens were present but no workers were observed. One additional observation may also be mentioned. On May 6, 1943, a male of *Bombus edwardsii* was captured on the campus of the University of California at Berkeley.

Frison (*in litt.*) suggests that the early production of males may be characteristic of several species of the subgenus *Pratobombus* and that the sexes mate early and the queens then aestivate.

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### THE SHIFT FROM AQUATIC TO AERIAL RESPIRATION IN DRAGONFLIES.

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Three nymphs of the very pretty little dragonfly that Linnaeus called *Libellula ornata* (now placed in *Celithemis*) were collected from a shallow flat-woods pond near Englewood, Florida, on the first day of March. Two of these nymphs showed by the crumpling of their developing wings, as seen through the transparent sheaths, that they were nearing their time of transformation. So I placed them in a wire-cloth pillow cage where I could watch the remaining phases of their nymphal behavior.

Both these nymphs made shifts of position that had to do with the change from aquatic to aerial respiration. Each in its turn (they were two days apart) climbed up the cloth into the air just far enough to expose its high-placed mesothoracic spiracles at the surface film of the water, as if to start them to breathing free air. Then it stayed there head up and motionless for one day.

Then each moved forward again up the screen enough farther so that the anal aperture of the rectal gill chamber was just dipping into the surface film, and stayed there immovable for two days. Then each transformed the following night, and was ready to begin aerial activity the next morning; its shining wings, tinted with gold and streaked with brown at the base, fully expanded; its cast-off gills left behind in the nymphal skin.

One day had been given to introducing the aerial, two days to tapering off the aquatic mode of respiration.